

REMARKS

Claims 1-3 and 5-14, all the claims pending in the application, stand rejected. Claim 1 is amended. Claims 2, 3 and 10-14 are cancelled.

In amended claim 1, “a reference flatness of 0.05 µm” is based on the description at page 6, lines 11-13 of the original specification. Also, in amended claim 1, the description “without direct contact therebetween” of the previously presented claim 1 is put into a definite expression “without bringing the surface of the glass substrate into contact with the surface of the polishing tool” on the basis of the description of page 3, lines 11-26 (especially, lines 11-14) of the original specification. Finally, in amended claim 1, “the machining liquid comprising fine powder particles of colloidal silica and an aqueous solution selected from water, an acidic aqueous solution, and an alkaline aqueous solution” is based on the description of the previously presented claim 3.

Claim Rejections - 35 USC § 103

Claims 1-3, 5, 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al (US 2002/0179576) in view of Taylor (US 5,761,790) and further in view of Ackerman (US 2002/0157421). This rejection is traversed for at least the following reasons.

First, as to claims 2, 3 and 5, the rejection is moot in view of the cancellation of those claims.

Claim 1

As to independent claim 1, the Examiner looks to Takeuchi for a disclosure of the majority of the steps recited in the claim, but admits that Takeuchi fails to specifically disclose performing a non-contact polishing step of polishing/float polishing and looks to Taylor for such teaching. The Examiner also admits that Takeuchi and Taylor fails to specifically disclose that the glass substrate being made of $\text{SiO}_2\text{-TiO}_2$ glass and looks to Ackerman for a method for producing fused silica glass that includes the use of $\text{SiO}_2\text{-TiO}_2$ glass. In the Examiner’s response to Applicants’ arguments, the Examiner further notes that Ackerman discloses the use of a glass substrate made of a $\text{SiO}_2\text{-TiO}_2$ glass in lithography processing

Essential Background

In reply, Applicants note as a preliminary matter that, where EUV light is used as the exposure light source, the glass substrate is required to have a flatness of 0.05 µm or less and a defect size of 0.05 µm or less (page 1, last line through page 2, line 1 of the original specification). In order to obtain the glass substrate having the flatness of 0.05 µm or less and the defect size of 0.05 µm or less, the flatness of the surface of the glass substrate is adjusted by local machining using plasma etching or a gas cluster ion beam. In this case, it is necessary to polish the surface of the glass substrate after the local machining in order to repair the roughened surface or to remove the surface defect (page 3, lines 4-10 of the original specification).

However, if a surface of a polishing tool, such as a polishing pad, is directly contacted with the surface of the glass substrate during polishing after the local machining, the flatness of the surface of the glass substrate may be deteriorated (page 3, lines 11-13 of the original specification).

Advance of the Invention

Against such a background, this invention as now recited in amended claim 1 uses not only “a non-contact polishing step of polishing, after the local machining of the flatness control step, the surface of the glass substrate subjected to the local machining by the action of a machining liquid interposed between the surface of the glass substrate and a surface of a polishing tool without bringing the surface of the glass substrate into contact with the surface of the polishing tool” but also “the machining liquid comprising fine powder particles of colloidal silica and an aqueous solution selected from water, an acidic aqueous solution, and an alkaline aqueous solution.”

In order to obtain a glass substrate having the defect size of 0.05 µm or less, it is necessary to use the fine powder particles of colloidal silica included in the machining liquid on carrying out the non-contact polishing step. This fact is supported by the description “As the abrasive grains having a small average grain size, use may be made of cerium oxide, silica (SiO₂), colloidal silica, zirconium oxide, manganese dioxide, and aluminum oxide. Among others, colloidal silica is preferable in view of the surface smoothness in case where the glass substrate is used.” on page 16, lines 3-7 of the original specification.

No Teaching Of Fine Powder Particles of Colloidal Silica In The Prior Art

None of Takeuchi et al, Taylor, and Ackerman, taken alone or in combination, discloses that it is necessary to use the fine powder particles of colloidal silica included in the machining liquid on carrying out the non-contact polishing step in order to obtain the glass substrate having the defect size of 0.05 μ m or less. That is, no one of Takeuchi et al, Taylor, and Ackerman discloses “a non-contact polishing step of polishing, after the local machining of the flatness control step, the surface of the glass substrate subjected to the local machining by the action of a machining liquid interposed between the surface of the glass substrate and a surface of a polishing tool without bringing the surface of the glass substrate into contact with the surface of the polishing tool, the machining liquid comprising fine powder particles of colloidal silica and an aqueous solution selected from water, an acidic aqueous solution, and an alkaline aqueous solution,” as stated in amended claim 1.

Applicants respectfully submit that, in the absence of these express limitations, amended claim 1 is patentable.

Claims 6-8, 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al (US 2002/0179576) in view of Taylor (US 5,761,790), Ackerman ((US 2002/0157421) and further in view of Ohnuma (US 6,924,068)). This rejection is traversed for at least the following reasons.

First, as to claims 11-13, the rejection is moot in view of the cancellation of the claims.

Claims 6-8

Applicants respectfully submit that claims 6-8 are also patentable because they depend from patentable claim 1 and Ohnuma does not remedy the deficiencies of the other art. In particular, Ohnuma also fails to disclose “a non-contact polishing step of polishing, after the local machining of the flatness control step, the surface of the glass substrate subjected to the local machining by the action of a machining liquid interposed between the surface of the glass substrate and a surface of a polishing tool without bringing the surface of the glass substrate into contact with the surface of the polishing tool, the machining liquid comprising fine powder particles of colloidal silica and an aqueous solution selected from water, an acidic aqueous solution, and an alkaline aqueous solution,” as stated in amended claim 1.

The Examiner admits that Takeuchi ,Taylor and Ackerman fail to disclose the steps of forming a thin on the glass substrate and patterning the thin film and transferring the thin film pattern of the transfer mask onto a semiconductor substrate by lithography. The Examiner looks to Ohnuma solely for a disclosure of a method for fabricating a photomask comprising the step of patterning the thin film and transferring the thin film pattern of the transfer mask onto a glass substrate by lithography, at col. 4, lines 53-60, and the use of a resist pattern formed by photolithography as a mask for processes such as etching base film, at col. 1, lines 16-20.

Applicants respectfully submit that the absence of the above express limitation in any of the cited prior art references, the claim is patentable.

Claims 9 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takeuchi et al (US 2002/0179576) in view of Taylor (US 5,761,790), Ackerman (US 2002/0157421) and further in view of Ohnuma (US 6,924,068))

First, as to claim 14, the rejection is moot in view of the cancellation of the claim.

Claim 9

Applicants respectfully submit that claim 9 is also patentable because it depends from patentable claim 1 and Ohnuma does not remedy the deficiencies of the other art, as already explained.

Indeed, the Examiner admits that Takeuchi ,Taylor and Ackerman fail to disclose the steps of forming a reflective multilayer on the glass substrate and forming a light absorber film on the reflective multilayer film. The Examiner looks to Ohnuma solely for a disclosure of a method for fabricating a photomask comprising the steps of forming a reflective multilayer that includes chromium on the glass substrate and forming a photoresist/light absorber film on the reflective multilayer film, at col 4, lines 58-62.

Applicants respectfully submit that Ohnuma fails to disclose “a non-contact polishing step of polishing, after the local machining of the flatness control step, the surface of the glass substrate subjected to the local machining by the action of a machining liquid interposed between the surface of the glass substrate and a surface of a polishing tool without bringing the surface of the glass substrate into contact with the surface of the polishing tool, the machining liquid

comprising fine powder particles of colloidal silica and an aqueous solution selected from water, an acidic aqueous solution, and an alkaline aqueous solution," as stated in amended claim 1.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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